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LISTS OF SPECIES

Assessment of fish assemblage in an urban system, Itapecerica River, upper São Francisco River basin, Divinópolis, Minas Gerais, Brazil

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ABSTRACT: Despite the economic and ecological importance of the Itapecerica River, there is no information about the local fish fauna. The aim of the present study was to provide a list of fish species in Itapecerica River, a tributary of the upper São Francisco River basin, inside an urban area. The specimens were collected quarterly from May 2010 to February 2012, using casting nets, trawl net and gillnets. We listed 29 species belonging to 21 genera of 14 families and 4 orders. Characiformes were represented by 16 species, Siluriformes by nine, Gymnotiformes and Perciformes by two each. Three alien species and five migratory fish were recorded. The low number of species found in this study in relation to São Francisco basin, could be reflecting the high level of degradation of waters in the Itapecerica River.

INTRODUCTION

Urbanization is a consequence of population growth and its consequent impacts on ecosystems represents a threat to native species assemblages and a challenge for biological conservation (Albert *et al*. 2003; Vitousek *et al*. 2008). In urban areas, where aquatic ecosystems are constantly suffering the discharges of effluents produced by human activities (Paul and Meyer 2001), populations of fish have to frequently adapts to environmental changes, resulting in reduction the number of fragile species and the increased density of fishes resistant to environmental variations (Reash and Berra 1987, Cunico *et al*. 2006). In these environments the fish assemblages are functionally less diverse than in nonurban streams, and they are vulnerable to invasion by exotic fish species, which can compete and prey on native fish populations (Cunico *et al*. 2011). Thus, changes in environmental conditions could promote a restructuring of fish assemblages (Onorato *et al*. 2000; Wang *et al*. 2000; Scott and Helfman 2001). Urban ecological studies have investigated both the impact of urban development on native ecosystems and the dynamics of urban environments themselves as ecosystems (Grimm *et al*. 2000).

In Divinópolis city, in central-west Minas Gerais State, the Itapecerica River is a very disturbed ecosystem, which receives a great assortment of effluents along its course (Menezes and Faria 2003). Previous chemical water analyses in Itapecerica River showed large amounts of chlorates, fecal coliforms, and heavy metals (Menezes and Faria 2003). The Itapecerica River belongs to the Pará River sub-basin, which flows to São Francisco River. Even with studies about the fish fauna of the Pará river basin (Alves 1995; Fonseca 2003; Santos *et al.* 2012) and despite the economic and ecological importance of the Itapecerica River, detailed studies of the fish fauna of the river Itapecerica are still incipient. In this context, the aim of the present study was to provide a list of fish species of an urban river stretch.

MATERIALS AND METHODS

The Itapecerica River is a major tributary of the Pará River that flows into the São Francisco River basin. It is inserted in a relatively industrialized and urbanized region, with Divinópolis being the most important urban center in the region, with about 250,000 inhabitants. The specimens were collected from two sites along the Itapecerica River: site A, upstream (20°13'09"S-44°54'51"O) and site B, in the center of Divinópolis (20°07'80''S-44°52'83''O) (Figure 1). The specimens were collected quarterly from May 2010 to February 2012, under the IEF license 018-10. Fish were caught using casting nets (3 and 5 cm mesh size), trawl net (50 mm mesh size) and gillnets. The gillnets had mesh sizes ranging from 1.5 to 6.0 cm (stretched mesh), were 10 m long and 2.0 m high. Each site, the gillnets were utilized with soaking time of approximately 14 h. Fish were euthanized by transversal section of the spinal cord following the ethical principles established by the Brazilian College of Animal Experimentation (COBEA). Representative specimens of each species identified were fixed in 10% formalin and preserved in 70% alcohol for voucher collection (Britski *et al*. 1984; Albert *et al*. 2004; Oyakawa and Mattox 2009; Britski *et al*. 2012). The voucher specimens were deposited in the MHN-UFMG Department of Zoology, access number MHN-UFMG 1445 to 1465. The research was approved by the Ethics Committee in Research Involving Animals (CEPEA - 49/2010) from the Federal University of São João del-Rei, Brazil.

RESULTS AND DISCUSSION

The knowledge about the composition and distribution

of fish fauna of the São Francisco River basin is not properly systematized. Currently, it is estimated that the São Francisco River basin has 208 fish species in the state of Minas Gerais, and that in the Pará River sub-basin occurs 21% of the ichthyofauna (Fonseca 2003; Alves *et al*. 2011). In the present study, a total of 800 individuals belonging to 29 species distributed in four orders, 14 families and 21 genera (Table 1) were collected. Characiformes were represented by 16 species, corresponding to 55.20% of the collected species. They are followed by Siluriformes (9 spp; 31%), Gymnotiformes (2 spp; 6.9%) and Perciformes (2 spp; 6.9%). This is the first list of fish in Itapecerica River, sub-basin Pará River, São Francisco River basin.

The predominance of Characiformes and Siluriformes is common in several Brazilian non-estuarine hydrographic basins (Buckup *et al.* 1999). The most representative family in the Itapecerica River was the non-monophyletic Characidae. This family is not unique to streams, but its members form the main group of water column species that do not make contact with the vegetation or substrate (Menezes *et al*. 2007). In contrast, the family Loricariidae represents an important component of the ichthyofauna of riverine ecosystems. In the present study were collected three species of "cascudo" of the genus *Hypostomus* (*Hypostomus francisci*, *Hypostomus garmani* and *Hypostomus* sp. A), which together accounted for 47% of the sampling. This result could be related to the physiographic characteristics of the Itapecerica River, which presents stretches waterfalls and bottom of rocky. According to Garavello and Garavello (2004) "cascudos" show large oral disk area as well as their large pectoral, pelvic, and caudal fins, which enable the interaction with the river bottom.

From the identified species, 26 are native and three are alien, from other basins inside the country (*Leporinus amblyrhynchus* and *Hoplosternum littorale*) or even from other continents (*Oreochromis niloticus*) (Figure 2). Fish species are still introduced around the world because of societal demands for fish products for food aquaculture (51%), ornamental fish (21%), sport fishing (12%) and fisheries (7%) (Gozlan 2008). *Leporinus amblyrhynchus* is endemic to Paraná basin (Garavello and Britski 1987), but it has also been recorded in the Cipó River, São Francisco basin (Vieira *et al*. 2005). The introduction of this species could be associated with recreational fisheries, once the genus *Leporinus* have been used of commercial and recreational fisheries, with a wide acceptance of its flesh for human consumption (Braga, 1993). The *Hoplosternum litoralle* is commonly used in some Brazilian basins as bait for capturing other fishes (Lowe-McConnell, 1999), and this could be a possible reason for its introduction in the Itapecerica River. The African species, such as *O. niloticus*, collected in the Itapecerica River and *Clarias gariepinus* (Burchell, 1822), in the Paraopeba River, are widely used in aquaculture due to their resistance and easy reproduction (Alves *et al*. 1999, 2008). This situation has led to a high number of escapes from aquaculture installations and the establishment of natural breeding populations (Gozlan *et al*. 2010). In the present study five species of migratory fishes (*Leporinus obtusidens*, *Salminus hilarii*, *Prochilodus argenteus*, *P. costatus* and *Pimelodus maculatus*) of the São Francisco River were caught. Despite the many factors that impact the Itapecerica River, 16 specimens in reproductive activity were captured (unpublished data) as well as juveniles of *P. argenteus* and *S. hilarii*, suggesting that this river plays an important role in maintaining fish stocks in the Pará sub-basin, mainly for migratory species (Santos *et al.* 2012). Overall these data constitute knowledge bases for the elaboration of recovery measures, conservation and management of the Itapecerica River.

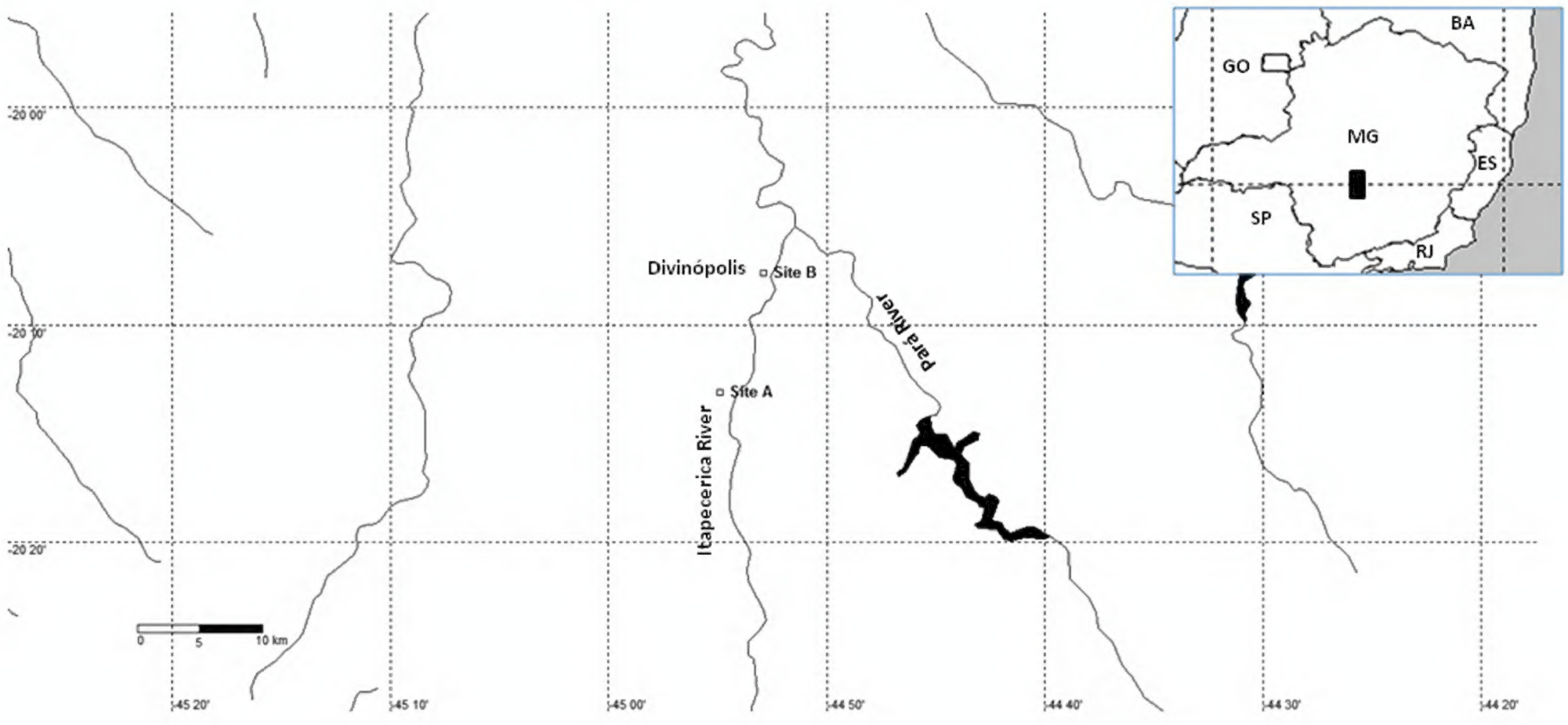
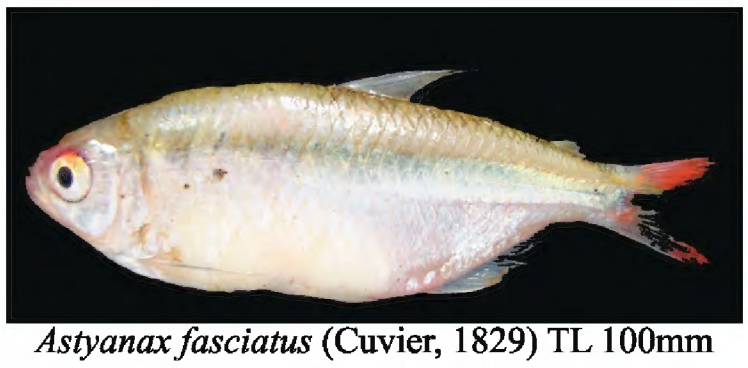
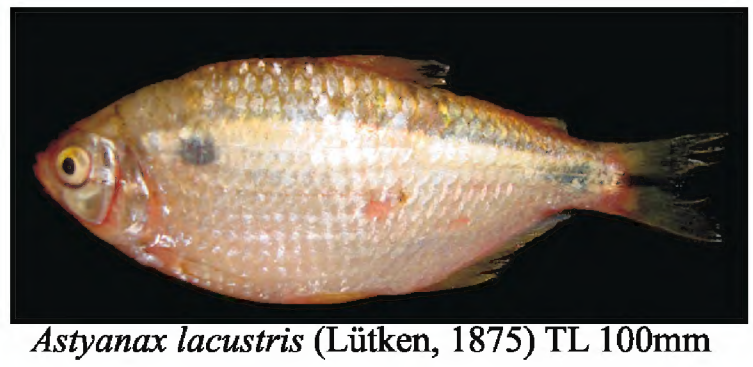


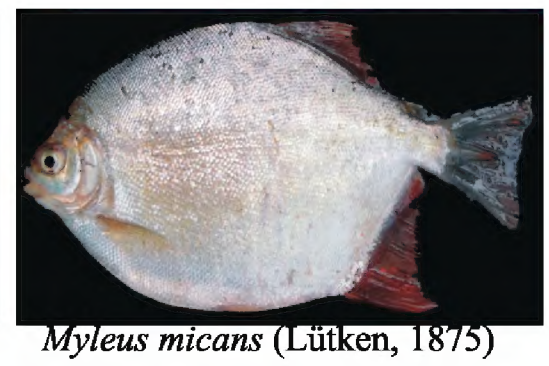
Figure 1. Location of sampling sites in the Itapecerica River, São Francisco River basin: site A upstream (20°13'09"S-44°54'51"O) and site B in the center of Divinópolis (20°07'80" S-44°52'83" W).



Astyanax fasciatus (Cuvier, 1829) TL 100mm



Astyanax lacustris (Lütken, 1875) TL 100mm

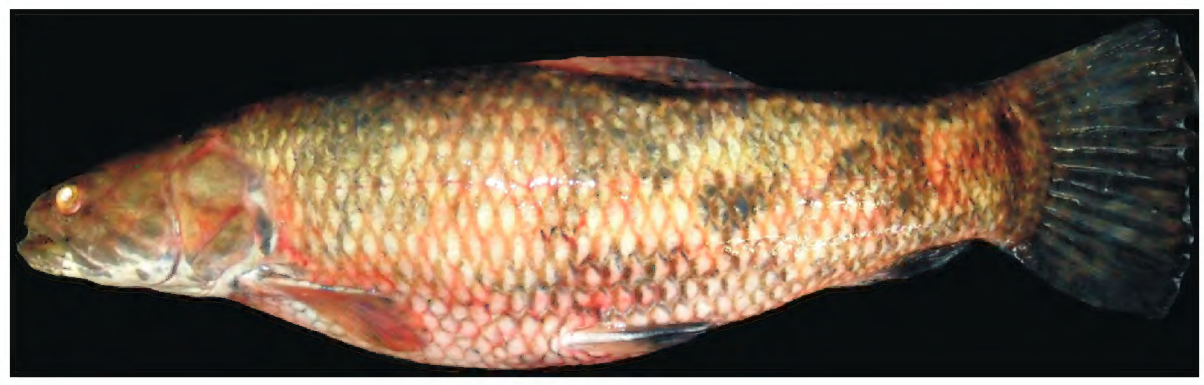


Myleus micans (Lütken, 1875) TL 140mm

Leporinus amblyrhynchus Garavello and Britski, 1987 TL 200mm

Prochilodus costatus Valenciennes, 1850 TL 250mm

Salminus hilarii Valenciènnes, 1840 TL 200mm



Hoplias malabaricus (Bloch, 1794) TL 250mm

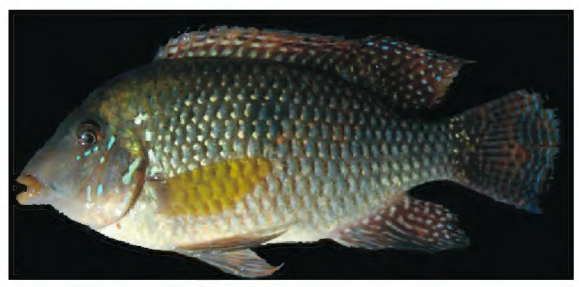
Pseudopimelodus charus (Valenciennes, 1840) TL 230mm

Hoplosternum littorale (Hancock, 1828) TL 140mm

Hypostomus francisci (Lütken, 1874) TL 150mm

Pimelodus maculatus Lacépède, 1803 TL 250mm

Eignmannia virescens (Valenciennes, 1847) TL 240mm



Geophagus brasiliensis (Quoy and Gaimard, 1824) TL 160mm

Oreochromis niloticus (Linnaeus, 1758) TL 200mm

FIGURE 2. Some fish species caught in Itapecerica River, São Francisco River basin, Divinópolis, Brasil.

Table 1. List of fish species from the Itapecerica River. Alien species was labeled with one asterisk and migratory fish with two asterisks.

TAXON
CHARACIFORMES
Characidae
Astyanax lacustris (Lütken, 1875)
Astyanax fasciatus (Cuvier, 1829)
Astyanax sp.
Bryconamericus stramineus Eigenmann, 1908
Piabina argentea Reinhardt, 1867
Salminus hilarii Valenciennes, 1840**
Myleus micans (Lütken, 1875)
Anostomidae
Leporinus amblyrhynchus Garavello and Britski, 1987*
Leporinus obtusidens Valenciennes, 1837**
Leporinus taeniatus Lütken, 1875
Erythrinidae
Hoplias intermedius (Günther, 1864)
Hoplias malabaricus (Bloch, 1794)
Parodontidae
Apareiodon hasemani Eigenmann, 1916
Prochilondontidae
Prochilodus argenteus Spix and Agassiz, 1829**
Prochilodus costatus Valenciennes, 1850**
Curimatidae
Cyphocharax gilbert (Quoy and Gaimard, 1824)
SILURIFORMES
Loricariidae
Hypostomus francisci (Lütken, 1874)
Hypostomus garmani (Regan, 1904)
Hypostomus sp. A
Callichthyidae
Hoplosternum littorale (Hancock, 1828)*
Heptapteridae
Pimelodella vittata (Lütken, 1874)
Rhamdia quelen (Quoy and Gaimard, 1824)
Pimelodidae
Pimelodus maculatus Lacepède, 1803**
Bagropsis reinhardti Lütken, 1874
Pseudopimelodidae
Pseudopimelodus charus (Valenciennes, 1840)
GYMNOTIFORMES
Sternopygidae
Eigenmannia virescens (Valenciennes, 1836)
Gymnotidae
Gymnotus sp.
PERCIFORMES
Cichlidae
Geophagus brasiliensis (Quoy and Gaimard, 1824)
Oreochromis niloticus (Linnaeus, 1758)*

Acknowledgments: Later species identification was kindly confirmed by Dr. Fábio Vieira of the MHN-UFMG. We would like to thank the FAPEMIG (Projeto Universal 00837/09) and the CNPq (Projeto Universal 482826/2010-0) for financial support.

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